

## BIBLIOGRAPHY

- Acton, Jan P. Evaluating Public Programs to Save Lives: The Case of Heart Attacks. Research Report R-73-02, Rand Corp., Santa Monica, CA. 1973.
- Acton, Jan P. "Measuring the Monetary Value of Lifesaving Programs." Law and Contemporary Problems 40 (Autumn 1976): 46-72.
- Akerlof, George A., and Dickens, William T. "The Economic Consequences of Cognitive Dissonance." American Economic Review 72 (June 1982): 307-319.
- Arnould, Richard J. and Nichols, Len M. "Wage-Risk Premiums and Worker's Compensation; A Refinement of Estimates of Compensating Wage Differential." Journal of Political Economy. Forthcoming.
- Arthur, W. Brian. "The Economics of Risks to Life." American Economic Review 71 (March 1981): 54-64.
- Ajzen, I., and Fishbien, M. "Attitude-Behavior Relations: A Theoretical Analysis and Review of Empirical Research." Psychological Bulletin 84 (1977): 888-918.
- Bailey, Martin J. Measuring the Benefits of Life-Saving. Washington, D.C.: American Enterprise Institute. 1979.
- Blomquist, Glenn. "Value of Life Saving: Implications of Consumption Activity." Journal of Political Economy 87 (June 1979): 540-558.
- Biomquist, Glenn. "The Value of Human Life: An Empirical Perspective." Economic Inquiry 19 (January 1981): 157-164.
- Blomquist, Glenn. "Estimating the Value of Life and Safety: Recent Developments." The Value of Life and Safety. M.W. Jones-Lee, ed. New York: North-Holland Publishing Company. 1982.
- Blomquist, Glenn, and Worley, Lawrence. "Hedonic Prices, Demands for Urban Housing Amenities, and Benefit Estimates." Journal of Urban Economics 9 (March 1981): 212-221.
- Bluestone, Barry. "The Personal Earnings Distribution: Individual and Institutional Determinants." Ph.D. thesis, University of Michigan. 1974.
- Bodily, Samuel E. "Analysis of Risks to Life and Limb." Operations Research 28 (January-February 1980): 156-175.
- Brookshire, David S.; Randall, Alan; and Stoll, John R. "Valuing Increments and Decrements in Natural Resource Service Flows." American Journal of Agricultural Economics 62 (August 1980): 478-488.
- Brookshire, David S.; Thayer, Mark A.; Schulze, William D.; and d'Arge, Ralph C. "Valuing Public Goods: A Comparison of Survey and Hedonic Approaches." American Economic Review 72 (March 1982): 165-177.

Energy and Resource Consultants, Inc.

- Broome, J. "Trying to Value a Life."\* Journal of Public Economics 9 (1978): 91-100.
- Brown, Charles. "Equalizing Differences in the Labor Market, Quarterly Journal of Economics. 94 (1 980): 113-134.
- Butcher, Arona. "A Review of Methodologies to Estimate the Value of Life Saving."\* Prepared for the U.S. Environmental Protection Agency by MITRE Corporation, McLean, Virginia, December 1981.
- Conley, Brian C. "The Value of Life in the Demand for Safety.\*, American Economic Review 66 (March 1976): 45-55.
- Cook, Philip J., and Graham, Daniel A. "The Demand for Insurance and Protection: The Case of the Irreplaceable Commodity.\*\* Quarterly Journal of Economics 91 (Feb; 1977): 141-156.
- Cooper, Barbara S. and Rice, Dorothy P. "The Economic Cost of Illness Revisited.\*\* Social Security Bulletin (February 1976): 21-36. 1976.
- Crespi, I. "What Kinds of Attitude Measures are Predictive of Behavior?\*" Public Opinion Quarterly 35 (1971): 327-34.
- Crocker, J.D.; Schulze, W.; Ben-David, S.; and Kneese, A.V. Methods Development for Assessing Air Pollution Control Benefits, Vol. I, Experiments in the Economics of Epidemiology. Environmental Protection Agency, Washington, D.C. 1979.
- Cropper, M.L. "Measuring the Benefits from Reduced Morbidity.", American Economics Association Papers and Proceedings 71 (1981): 235-240.
- Dardis, Rachel. "The Value of a Life: New Evidence from the Marketplace.\*\* American Economic Review 70 (December 1980): 1077-1082.
- Dillingham, Alan E. "The Injury Risk Structure of Occupations and Wages.\* Unpublished Ph.D. Dissertation, Cornell University, 1979.
- Erskin, H. "The Polls: Pollution and its Costs." Public Opinion Quarterly 36 (1972): 120-i 35.
- Fanshei, S., and Bush, J.W. "A Health-Status Index and Its Application to Health-Services Outcomes." Operations Research 18 (1970): 1021-1066.
- Fischhoff, B., et al. "How Safe is Safe Enough? A Psychometric Study of Attitudes Towards Technological Risks and Benefits." Policy Sciences 9 (1978): 127-152.
- Fischhoff, B., Slovic, P., and Lichtenstein, S. "Weighing the Risks." Environment 21 (1979): 17-20, 32-38.
- Fisher, Anthony; Hamilton, James; and Scotchmer, Suzanne. "Assessing the Economic Effects of Implementing Air Quality Management Plans in California." Volume II. Part II. "Available Methods for Estimating the Economic Damages Resulting from Air Pollution.", For California Air Resources Board, San Francisco. 1979.

- Frankel, Marvin. "Hazard, Opportunity and the Valuation of Life." Unpublished preliminary report. Department of Economics, University of Illinois at Urbana-Champaign. November 1979.
- Freeman, A. Myrick III. The Benefits of Air and Water Pollution Control: A Review and Synthesis of Recent Estimates. Prepared for the Council on Environmental Quality, Washington, D.C., December 1979a.
- Freeman, A. Myrick, III. The Benefits of Environmental Improvement: Theory and Practice. Baltimore: Johns Hopkins University Press for Resources for the Future. 1979b.
- Chosh, D.; Lees, D.; and Seal, W. "Optimal Motorway Speed and Some Valuations of Time and Life." Manchester School of Economic and Social Studies 43 (June 1975): 134-143.
- Crether, David M. and Plott, Charles P. "Economic Theory of Choice and the Preference Reversal Phenomenon." American Economic Review 69 (September 1979): 623-648.
- Hamermesh, Daniel S. "Economic Aspects of Job Satisfaction." in Orley Ashenfelter and Wallace Oates, eds., Essays in Labor Market and Population Analysis. New York: John Wiley and Sons. 1977.
- Hapgood, Fred. "Risk-Benefit Analysis: Putting a Price on Life." Atlantic 243 (1979): 33-38.
- Harrison, David, Jr., and Rubinfeld, Daniel L. "Hedonic Housing Prices and the Demand for Clean Air." Journal of Environmental Economics and Management 5 (March 1978): 81-102.
- Hirshliefer, J. "An Economic Approach to Risk-Benefit Analysis." Risk Benefit Methodology and Application. D. Okrent (ed.). Asilomar, California. 1975.
- Howard, Ronald A. "Life and Death Decision Analysis." Mimeo, Stanford University, May 1977.
- Jones-Lee, Michael W. The Value of Life: An Economic Analysis; Chicago: The University of Chicago Press. 1976.
- Jones-Lee, Michael W. "The Value of Human Life in the Demand for Safety: Comment." American Economic Review 68 (September 1978): 712-716.
- Jones-Lee, Michael W. "Maximum Acceptable Physical Risk and a New Measure of Financial Risk Aversion." Economic Journal 90 (September 1980): 550-568.
- Keeney, Ralph L. "Evaluating Alternatives Involving Potential Fatalities." Operations Research 28 (January-February 1980).
- Lichtenstein, S. and Slovic, P. "Reversal of Preferences Between Bids and Choices in Gambling Decisions." Journal of Experimental Psychology 89 (July 1971): 46-55.
- Lichtenstein, Sarah; Slovic, Paul; Fischhoff, Baruch; Layman, Mark; and Combs, Barbara. "Judged Frequency of Lethal Events." Journal of Experimental Psychology: Human Learning and Memory 4 (November 1978): 551-578.

- Lindmann, H.R. "Inconsistent Preferences among Gamblers." Journal of Experimental Psychology 89 (August 1971): 390-397.
- Linnerooth, Joanne. "The Value of Human Life: A Review of the 'Models.'" Economic Inquiry 17 (January 1979): 52-74.
- Lipsey, Robert E. "Comments on The Value of Saving a Life: Evidence from the Labor Market." In Nestor E Terleckyj, ed., Household Production and Consumption. New York: Columbia University Press for NBER 1975.
- Litai, Dan. "A Risk Comparison Methodology for the Assessment of Acceptable Risk." Ph.D. Dissertation. Massachusetts Institute of Technology. January 1980.
- Lui, Ben-Chieh, and Yu, Eden S. Physical and Economic Damage Functions for Air Pollutants by Receptor. Environmental Protection Agency, Corvallis. 1976.
- Lucas, Robert E. B. "Working Conditions, Wage Rates, and Human Capital: A Hedonic Study." Ph.D. thesis. Massachusetts Institute of Technology. 1972.
- Mendelsohn, Robert. "Estimating the Demand for the Characteristics of Housing." Mimeo. University of Washington, Seattle. July 1982.
- Mishan, E.J. "Evaluation of Life and Limb: A Theoretical Approach." Journal of Political Economy 79 (July/August 1971): 687-705.
- Mishan, E.J. "Recent Contributions to the Literature of Life Valuation: A Critical Assessment." The Value of Life and Safety. M.W. Jones-Lee, ed. New York: North Holland Publishing Company. 1982
- Mulligan, Patricia J. "Willingness-to-Pay for Decreased Risk from Nuclear Plant Accidents." Working Paper No. 3, Energy Extension Programs, Pennsylvania State University. November 1977.
- Murphy, John Fletcher. "Sore Throat hlanagement - Decision Analysis Using Pleasant Hour Equivalents." Computers and Biomedical Research 12 (1979): 203-219.
- Oaxaca. "Male-Female Wage Differentials in Urban Labor Markets." International Economic Review 14 (1973): 693.
- Olson, C.A. "An Analysis of Wage Differentials Received by Workers on Dangerous Jobs." Journal of Human Resources 16 (1981): 167-1 85.
- Ostro, B.D. "Urban Air Pollution and Morbidity: A Retrospective Approach." Journal of Environmental Economics and Management. Forthcoming.
- Otway, H. J. "Review of Research on Identification of Factors Influencing Social Response to Technological Risks." IAEA Paper CN-36/4 International Atomic Energy Agency, Vienna. In Vol. 7 of Nuclear Power and its Fuel Cycle, IAEA Proceedings. 1977.
- Otway, H. J. and Cohen, J. J. "Revealed Preferences: Comments on the Starr Benefit-Risk Relationships." International Institute for Applied System Analysis, Report IIASA Rm-75-5. 1975.

- Pliskin, J.S.; Shepard, D.S.; and Weinstein, M.C. "Utility Functions for Life Years and Health Status." Operations Research 28 (January-February 1980): 206-224.
- Pommerehne, W.W.; Schneider, F., and Zweifel, P. "Economic Theory of Choice and the Preference Reversal Phenomenon: A Reexamination." American Economic Review 72 (June 1982): 569-574.
- Portney, Paul R. "Housing Prices, Health Effects, and Valuing Reductions in Risk of Death." Journal of Environmental Economics and Management 8 (March 1981): 72-78.
- Quinn, Joseph. "The Microeconomics of Early Retirement," Ph.D. thesis. Massachusetts Institute of Technology. 1975.
- Reilly, Robert J. "Preference Reversal: Further Evidence and Some Suggested Modifications in Experimental Design." American Economic Review 72 (June 1982): 576-584.
- Rhoads, S.E. "How Much Should We Spend to Save a Life." The Public Interest 51 (1978): 74-92.
- Rosen, Sherwin. "Hedonic Prices and Implicit Markets." Journal of Political Economy 82 (January/February 1974): 34-55.
- Rosen, Sherwin. "Wage-based Indexes of Urban Quality in Life." In Current Issues in Urban Economics. Edited by Peter Miestkowski and Mahlon Straszheim. Baltimore and London: Johns Hopkins University Press. 1979.
- Rosen, Sherwin. "Valuing Health Risks." American Economic Review 71: 241-245. 1981.
- Rowe, Robert D., and Chestnut, Lauraine G. The Value of Visibility: Economic Theory and Applications for Air Pollution Control. Cambridge, Massachusetts: Abt Books. 1982.
- Rowe, W. D. An Anatomy of Risk. New York Wiley. 1977.
- Schelling, T.C. "The Life You Save May Be Your Own." In Samuel B. Chase, Jr., ed. Problems in Public Expenditure Analysis. Washington, D.C.: Brookings Institution. 1968.
- Shepard, Donald S., and Zeckhauser, Richard J. "On Purchasing Survival." The Value of Life and Safety. M.W. Jones-Lee, ed. New York North-Holland Publishing Company. 1982.
- Slovic, P.; Fischhoff, B.; and Lichtenstein, S. "Accident Probabilities and Seat Belt Usage: A Psychological Perspective."\* Accident Analysis and Prevention, December 1977.
- Smith, Robert S. "The Feasibility of an 'injury Tax' Approach to Occupational Safety." Law and Contemporary Problems 38 (1974): 730-744.
- Smith, Robert S. The Occupational Safety and Health Act. Washington, D.C.: American Enterprise Institute for Public Policy Research 1976.

- Smith, Robert S. "Compensating Wage Differentials and Public Policy: A Review." Industrial and Labor Relations Review 32 (April 1979): 339-352.
- Smith, V. Kerry. "The Role of Site and Job Characteristics in Hedonic Wage Models." Southern Economic Journal. Forthcoming.
- Starr, C. "Social Benefit vs. Technological Risk." Science 165 (1969): 1232-1238.
- Taobman, Paul. Sources of Inequality in Earnings. New York: American Elsevier Publishing Company. 1975.
- Thaler, Richard. "Precommitment and the Value of a Life." The Value of Life and Safety. M.W. Jones-Lee, ed. New York: North-Holland Publishing Company. 1982.
- Thaler, Richard and Gould, William. "Public Policy Toward Life Saving: Should Consumer Preferences Rule?" Journal of Public Analysis and Management 1 (1982): 223-242.
- Thaler, Richard, and Rosen, Sherwin. "The Value of Life Saving." In Nestor E. Terleckyj, ed., Household Production and Consumption. New York: Columbia University Press for NBER. 1975.
- Thurow, Lester C. "Psychic Income: Useful or Useless." American Economic Review 68 (May 1978): 142-145.
- Torrance, G. W. "Health Status Index Models: A Unified Mathematical View." Management Science 22 (1976): 990-1001.
- Tversky, Amos and Kahneman, Daniel. "The Framing of Decisions and the Psychology of Choice." Science 211 (January 30, 1981): 453-458.
- University of Michigan Institute for Social Research. Survey of Working Conditions. SRC Study No. 45369. Ann Arbor: University of Michigan Social Science Archives. 1975.
- Usher, Dan. "An Imputation to the Measure of Economic Growth for Changes in Life Expectancy." In Milton Moss, ed. The Measurement of Economic and Social Performance. Studies in Income and Wealth Vol. 38. New York: National Bureau of Economic Research. 1973.
- Varian, Hal R. Microeconomic Analysis. New York: W. W. Norton and Company. 1978.
- Viscusi, W.K. "Health Effects and Earnings Premiums for Job Hazards." Review of Economics and Statistics 60 (1978a): 408-16.
- Viscusi, W.K. "Labor Market Valuations of Life and Limb: Empirical Evidence and Policy Implications." Public Policy 26 (Summer 1978b): 359-386.
- Weinstein, M.C.; Shepard, D.S.; and Pliskin, J.S. "The Economic Value of Changing Mortality Probabilities: A Decision-Theoretic Approach." The Quarterly Journal of Economics 94 (March 1980): 375-396.

Weinstein, M.S., and Stason, W.B. Hypertension: A Policy Perspective. Cambridge, Mass.: Harvard University Press. 1976.

Zeckhauser, Richard. "Procedures for Valuing Lives." Public Policy 23 (Fall 1975): 419-464.

Zeckhauser, R. and Shepard, D.S. "Where Now for Saving Lives?" Law and Contemporary Problems 40 (Fall 1976): 5-45.

## APPENDIX

ACTON STUDY QUESTIONNAIRE

WILLINGNESS-TO-PAY QUESTIONNAIRE

1. What do you think is the most important health problem in this country?

---

---

2. How would you rank these four health problems so that the first problem is the one you would like to see us work hardest on?

Maternity and infant care	_____
Automobile accidents	_____
Heart disease	_____
Cancer	_____

(Place a "1" next to the most important item, a "2" next to the second most important, and so forth.)

3. Suppose two victims of an automobile accident arrive at a hospital at the same time. Both men are badly hurt and will probably die if not given a lot of medical care. Suppose that there are enough doctors and nurses there to be able to save one of the person's



**(CONTINUE ASKING FOR THE FOLLOWING PAIRS)**

<b>5b.</b>	<b>etc.</b>	<b>TWO</b>	<b>60</b>	<b>ONE</b>	<b>30</b>
		"	50	"	30
		"	40	"	30
		"	70	"	40
		"	60	"	40
		"	70	"	50

6. Now let's suppose that one man and one woman are brought in very badly hurt. Again, the doctors can 1 vs only one of them. We don't know if the man is a father or if the Woman is a mother. Which do you think they should save, 1 40 year old WOMAN or a 20 year old MN?

6a. 40 WOMAN 20 MAN

**(CONTINUE ASKING FOR THE FOLLOWING PAIRS)**

<b>6b.</b>	<b>ate.</b>	<b>30 WOMAN</b>	<b>20</b>	<b>MAN</b>
		30 "	30	"
		20 "	30	"
		20 "	40	"

7. Have you heard about the new hurt attack ambulances they are trying out in New York and a few other cities?

YES NO

8. They are thinking about putting ambulances and other devices in communities 1 round the country, but only if people 1 e willing to pay enough for them. This program would be for you and 10,000 people living around you. In your area, there 1 e about 100 heart attacks per year. About 40 of these 100 persons die. With the heart attack program, only 20 of these people would die. How

**such would you be willing to pay in taxes per year for the ambulance so that 20 lives could be saved in your community**

\$ \_\_\_\_\_

9. **There is a more economical program you could have (it has a different ambulance coverage and other features) . Instead of saving 20 lives per year, it would save 10 lives. How much would you be willing to pay in taxes per year for this program so that 10 lives could be saved in your community?**

\_\_\_\_\_

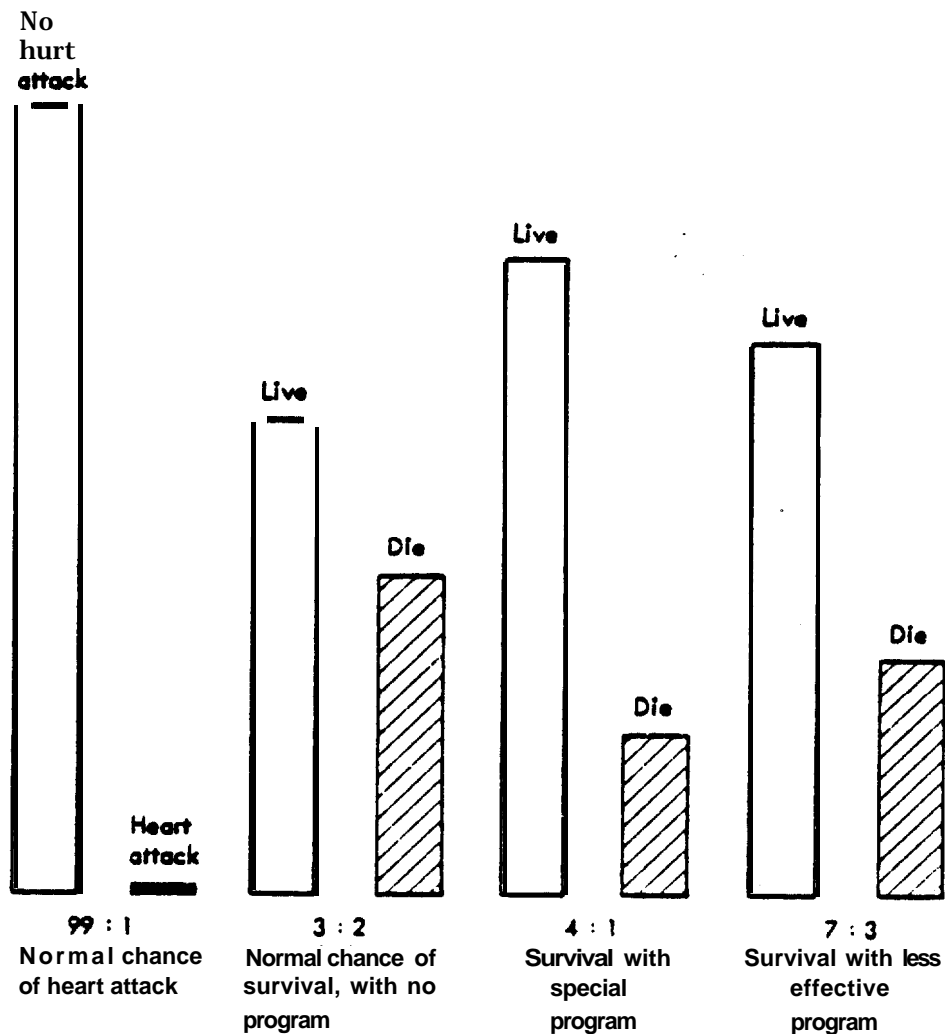
10. **Let's say that one of your neighbors comes to you for advice. He has just been to his doctor and the doctor tells him that there is one chance in 100 that he will have a heart attack in the next year. If he has the heart attack, the odds are 3 to 2 that he will live. Your neighbor has just heard about the heart attack program that can cut his chance of dying from the heart attack in half and he wants to know how much it is worth to him. How much do you think he should be willing to pay in taxes for a heart attack program in his neighborhood (1.8% the chances are 2 per 1,000 he will have a heart attack and be saved by the program this next year)?**

\_\_\_\_\_

11. **How much do you think he should be willing to pay for the less expensive program which is half as effective? That is, the odds would be 7 to 3 that he would live after a heart attack (i.e., the chances are 1 per 1,000 it will save his life).**

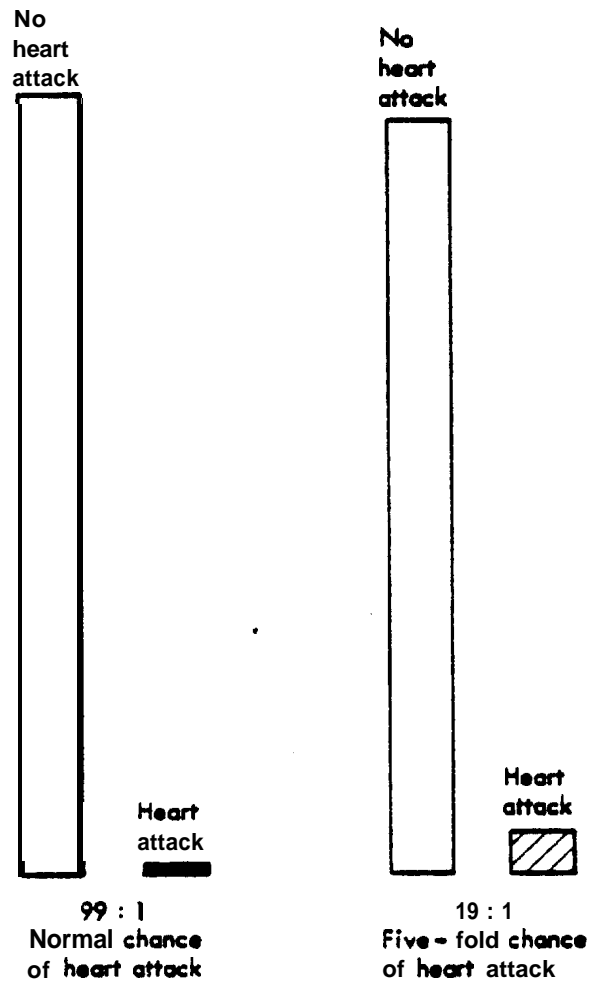
\_\_\_\_\_

6rd A



12. SEE CARD B Let's say that the doctor told your neighbor that he has five times the normal risk of a heart attack-that is, the odds are 1 to 19 that he will have a heart attack aext year. If he could still cut his chance of dying from the heart attack in half, how much do you think he should be willing to pay in taxes for the heart attack program per year (1.0..the chaacu are 10 per 1,000 It will save his life)?

Card 8



13. How much do you think he should be willing to pay in taxes for the less expensive program which is half as effective (i.e., 5 per 1,000 it will save his life)?

On the following questions, we ask your own willingness to pay for some of the heart attack program. You should answer as if the stated probabilities are valid for you, and reductions in heart attack mortality are also valid. We can use a combination

of ambulances, self-carried drugs, and other means to make certain that the reductions will be achieved even if you are away from your home community frequently.

As far as the amount, it pays for you to state the highest amount you are willing to pay. We will ask a number of persons how much they are willing to pay, and if we can cover the costs, the program will be established. If the program cost less than you said you were willing to pay, then you will be charged only actual costs; but if the cost is even \$1 more than you say, you will not be covered and will have to wait until next year to be able to join again.

14. **SEE CARD A** Let's suppose that your doctor tells you that the odds are 99 to 1 against your having a heart attack. If you have the attack the odds are 3 to 2 that you will live. The heart attack program would mean that the odds are 4 to 1 that you live after a heart attack. How much are you willing to pay in taxes per year to have this heart attack program which would cut your probability of dying from a heart attack in half (i.e., the chances are 2 per 1,000 you will have a heart attack and be saved by the program this next year)?

\$ \_\_\_\_\_

15. The less expensive program gives you 7 to 3 odds of living after a heart attack. How much are you willing to pay in taxes per year to have this program (i.e., 1 per 1,000 it will save your life)?

\_\_\_\_\_

16. Finally, let's suppose for some reason the doctor told you that your odds of having a heart attack are 1 to 19. If you could still cut your chance of dying in half, how much are you willing

to pay for the program which gives you odds of living if you have  
a heart attack (i.e., 10 per 1,000 it will save your life)?

\$ \_\_\_\_\_

17. How much are you willing to pay for the less expensive program  
which gives you 7 to 3 odds of living if you got a heart attack  
(i.e., 5 per 1,000 it will save your life)?

\$ \_\_\_\_\_

18. Suppose a local bond issue is proposed to pay for a heart attack  
program to help you and your neighbors. If your household taxes  
were going to be raised \$10 per year by this bond, how many lives  
(or fraction of a life) would you demand that it save per year to  
be worth \$10. That is., if it will not save the number of lives  
you demand, then you will vote NO on the bond.

Smallest number of lives  
that must be saved to be  
worth \$10                      p e r                      year

19. What if the bond for the program will raise your taxes \$20 per  
year. How many lives (or fraction) will you want it to save or  
if you vote NO?

Smallest number of lives  
that must be saved to be  
worth \$20                      p e r                      year

20. Now, what if the heart attack bond issue will raise your household's  
taxes \$100 per year what is the smallest number of lives (or  
fraction) you demand that it save per year or else you vote NO?

Smallest number of lives  
that must be saved to be  
worth \$100 per year

- 21.** Finally, suppose your neighbor comes to you for advice—but his question is little different than it was before. He has been told that he has a 1 in 100 chance of a heart attack and can reduce his mortality from the heart attack from 2/5 to 1/5 (i.e., the chances are 2 per 1,000 that he will have a heart attack and have his life saved). He decides this program is worth \$100 per year to him. His question is: how much should he pay for the program which is half as effective (i.e., the chances are 1 per 1,000 he will have a heart attack and have his life saved)?

\$50  
more than \$50  
less than \$50

- 23.** Suppose his is at a fivefold risk of heart attack and can cut his heart attack mortality from 2/5 to 1/5, how much should he pay (i.e., the chances are 10 per 1,000 he will have a heart attack and have his life saved by the program)?

\$500  
more than \$500  
less than \$500

To make the study more complete, we need to know a few things about you and your family.

Sex: Male Age:  
Female

Are you: Married now - 1  
Widowed or divorced - 2  
Never married - 3

Are you the head of the household?      Ye.      No

## DEPENDENTS AND MEMBERS OF THE HOUSEHOLD

	living at home	YES	NO
Wife or husband	<u>          </u>	Y	N
SOW	<u>          </u>	Y	N
	<u>          </u>	Y	N
	<u>          </u>	Y	N
	<u>          </u>	Y	N
	<u>          </u>	Y	N
Daughters	<u>          </u>	Y	N
	<u>          </u>	Y	N
	<u>          </u>	Y	N
	<u>          </u>	Y	N
<b>Parents</b>	<u>          </u>	Y	N
	<u>          </u>	Y	N
<b>Others (specify)</b>	<u>          </u>	Y	N

How many years of schooling do you have?                                 

What is the highest degree you hold?

No degree - 1	Master - 4	M.D. - 6
H.S. Diploma - 2	Ph.D. - 5	LLB - 7
Bachelor - 3		

If Bachelor's degree or higher, what was the subject of the degree?

**Physical science = 1**

**Social science = 2**

Arts or Humanities = 3

**Economics = 4**

Business = 5

Math or Statistics = 6

Do you rent or own your home?

Rent - 1

Own -2

It may be Important to know how people of different incomes answer these questions.

What was the combined income, before taxes, for you, your dependents, and those living with you per year?

\$ \_\_\_\_\_

What is the lifetime net worth of you, your household, and dependents? This should include your ownership of a home, a car, any saving or other assets; but you should subtract debts.

\$ \_\_\_\_\_

It may be important to know how much people spend on medical care, so we would like to ask a few questions about your medical expenses.

About how much did you and members of your family living with you pay for medicine and visits to a doctor (not hospitalization) this last year? Please include any out of pocket paid by insurance.

\$ \_\_\_\_\_

What part was paid by insurance?

\_\_\_\_\_ %

Did you or anyone in your family living with you go to the hospital this last year?

Yes. \_\_\_\_\_

No. \_\_\_\_\_

IF YES

Person (Relation)	Age	Reason*	About how much did this cost?	Put paid by insurance or other
----------------------	-----	---------	----------------------------------	--------------------------------------

---



---

\* REASONS: An operation = 1  
A hurt condition = 2  
Something else = 3

About how much do you and members of your family living with you  
spend on hospital insurance and doctor payments insurance (like  
Blue Cross, Blue Shield, or a company policy)?

\$ \_\_\_\_\_

About how much life insurance do the members of your family have?  
Please include any policies that the person may have through work  
or any other group.

Person	Age	Amount of Coverage
--------	-----	--------------------

---



---

Would you rate your general health as excellent, good, fair, or  
poor

EXCELLENT \_\_\_\_\_ GOOD \_\_\_\_\_ FAIR \_\_\_\_\_ POOR \_\_\_\_\_

Have you or anyone in your family living with you ever had any  
hurt disease?

Self - 1  
Other member = 2  
No one = 3

# JONES-LEE QUESTIONNAIRE

## 'VALUE OF SAFETY' QUESTIONNAIRE

1. Suppose that for various reasons you have decided to make a particular journey by air and have the choice of travelling on one of two airlines, A or B. These two airlines use the same type of aircraft and provide effectively identical services (same journey time, same route, same frequency of flights, similar food and in-flight facilities etc.)

Airline A's fare is **£100**. Furthermore, airline A has a recent safety record of 2 fatal crashes in 500,000 flights.

At what fare would you just be induced to fly by airline B rather than airline A if the recent safety record for airline B is:

- |     |    |       |         |    |         |        |       |
|-----|----|-------|---------|----|---------|--------|-------|
| (a) | 0  | fatal | crashes | in | 500,000 | flight | _____ |
| (b) | 1  | "     | "       | "  | "       | "      | _____ |
| (c) | 5  | "     | "       | "  | "       | "      | _____ |
| (d) | 10 | "     | "       | "  | "       | "      | _____ |
| (e) | 20 | "     | "       | "  | "       | "      | _____ |

If in any instance you would not fly by airline B at any price then put 'X'.

Assume that you are to be paid fixed expenses of **£100** for the journey and that you will be unaccompanied by wife or other members of your family. You should also assume that the recent crash record is the only available information concerning the safety of each airline.

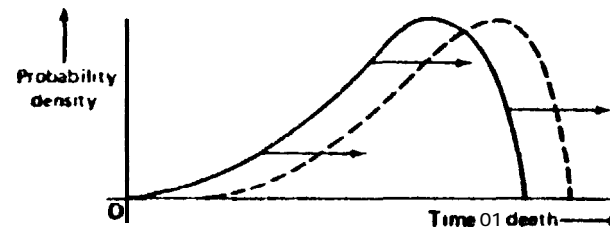
2. Assuming that you would again be paid expenses of **£100/journey**, would your answer to question 1 be different if the journey was to be made once per week for one year? If the answer is 'yes', then indicate the modified fares in parentheses beside the answer to question 1. If the answer is 'no', then write 'no' here.
3. Suppose that you face a job location decision, the alternatives being areas A and B. (Assume that the option of remaining in your current location is not available.) Suppose further that considering all pros and cons *except* (a) house prices and (b) the impact of environmental pollution on life expectancy\* you are indifferent between the two alternative locations.

If area A has a 'normal' level of environmental pollution (so that your life expectancy will be as given by standard mortality tables), indicate the premium or discount on area B house price relative to area A which would just induce you to choose area B if the environmental pollution for area B is such as to change your life expectancy by :

- |     |                      |               |
|-----|----------------------|---------------|
| (a) | adding 1 year        | _____ / _____ |
| (b) | adding 5 years       | _____ / _____ |
| (c) | adding 10 years      | _____ / _____ |
| (d) | subtracting 1 year   | _____ / _____ |
| (e) | subtracting 5 years  | _____ / _____ |
| (f) | subtracting 10 years | _____ / _____ |

Give one set of answers for the case in which the effect on life expectancy applies only to yourself and (if you have a family) one set for the case in which it applies both to yourself and your family. *Give premia and discounts in absolute amounts of money rather than as percentages.* Assume that you plan to remain in the new location for a sufficiently long time for any differential capital gains on house resale to be negligible (i.e. the premium or discount on current purchase price is to be an effective once-for-all lump sum gain or loss).

- \* An increase in life expectancy is an increase in the statistical mean age at death and will therefore inevitably affect the entire probability density function for time of death. In this case you may assume that there is negligible error in treating this as an effective rightward shift in the density function, i.e.



4. What is your current age?
5. What is your current salary?
6. What is your current occupation?

MULLIGAN STUDY QUESTIONNAIRE

INTRODUCTION

This survey will require your special attention. Although the situation being described is hypothetical, please answer the questions as if you were actually faced with the decision. You will be asked about your willingness to pay to avoid certain risks of death or injury to yourself resulting from a nuclear plant accident. You will also be asked about your willingness to receive money to permit these risks to occur. Please keep in mind that the risks being dealt with are only those that affect you, and not your community, friends, family etc.

A nuclear plant accident, in this case, would include any type of explosion, plus any other mishap, act of sabotage or war, or natural disaster which would cause large amounts of radioactive material to be released from the plant and into the environment. A serious injury would be any illness or injury resulting from the plant accident, which would require hospitalization in normal times. Also counted as injuries would be the long term aftereffects such as cancer, sterility, birth defects in children born after the accident, and a shortening of life expectancy.

THE CASE: PAYMENT FIRST

You will be asked whether you would pay or would receive money, for changes which would decrease or increase these risks. In the first case, you are being asked whether you would pay for a change which would lower these risks. We are not specifying what changes would be neces-

sary, but examples might be changes in the nuclear plant itself, to changing to an entirely different energy system such as coal or solar energy. The method of payment for this change is an addition to your monthly energy bill. If your home is electrically heated, your monthly energy bill equals your electricity bill. If your home is heated any other way, your energy bill equals your electricity bill plus your monthly fuel bill. If you live in an apartment where your landlord pays for heating and utilities, the increase you would be paying would be an increase on your monthly rent. This would be the only means of payment available, and all people in the United States would pay a similar amount proportionate to their use of energy.

1. Please estimate your average monthly energy bill, it is not necessary to be exact.

The next several questions refer to changes in risk levels. Here is a graph representing those changes. If you like, refer to it with me as you answer the following questions.

#### PAYMENT QUESTIONS

2. Suppose that under a certain system of nuclear plant operation, accidents occurred that killed or injured 200,000 people. Since there are 200,000,000 people in the United States, your (your child's) chance of being one of those affected would be 1 in 1,000. A change which would lower the number of people affected to 20,000 would also decrease your (your child's) risk from 1 in 1,000 to 1 in 10,000. What is the largest increase on your monthly energy bill that you would pay to cause this change, about \$5? (Would you be willing to pay more, less, nothing?)

3. In order to further lower your (your child's) risk of being killed or injured from 1 in 10,000 to 1 in 100,000; or to lower the number of people affected from 20,000 to 2,000. What is the largest additional amount you would be willing to pay, another \$5? (etc.)

4. To lower the risk further, from 1 in 100,000 to 1 in 1,000,000; or to decrease the number of people affected from 2,000 to 200, what is the largest addition you would be willing to pay?

5. To cause a change which would lower your (your child's) risk further from 1 in 1,000,000 to 1 in 10,000,000; or the number of people from 200 to 20, would you be willing' to pay another \$5?

6. Finally, for a change which would lower your (your child's) risk of being killed or injured in a nuclear plant accident from 1 in 10,000,000 to 1 in 100,000,000; and which would decrease the number of people affected from 20 to 2. how much of an addition would you be willing to pay on your average monthly energy bill?

7. (To the interviewer) What was the accumulative amount bid by the participant?

This time let us consider a different situation. Now you are asked to receive money to permit risk levels to increase. Some examples of this kind of change might be to permit weaker safety standards in nuclear plants, to locate plants nearer to areas of high population, or to permit more plants to be operated at the same time. The way in which you would receive this money would be through a reduction in your monthly energy bill, and all people in the United States would receive a similar amount of money proportionate to their energy use.

COMPENSATION QUESTIONS

8. Suppose that under a certain system of nuclear plant operation, accidents occurred that killed or injured 2 people. Since there are 200,000,000 people in the United States, your (your child's) risk of being one of those affected would be 1 in 100,000,000. A change which would raise the number of people affected to 20 would also increase your (your child's) risk from 1 in 100,000,000 to 1 in 10,000,000. If you would permit this change what is the smallest amount of money you would be willing to receive as a reduction on your energy bill, \$5?

9. In order to permit a further increase in your (your child's) risk of being killed or injured from 1 in 10,000,000 to 1 in 1,000,000 or to increase the number of people affected from 20 to 200, what is the smallest additional reduction on your energy bill that you would want to receive, another \$5?

10. To permit the risk to rise further from 1 in 1,000,000 to 1 in 100,000; or to increase the number of people affected from 200 to 2,000, would you wish to receive an additional \$5? (etc.)

11. For a change which would raise your (your child's) risk further from 1 in 100,000 to 1 in 10,000, or to increase the number of people affected from 2,000 to 20,000, what is the least additional amount that you want to receive?

12. Finally, for a change which would raise your (your child's) risk of being killed or injured in a nuclear plant accident from 1 in 10,000 to 1 in 1,000; and which would decrease the number of people affected from 20,000 to 200,000, what is the smallest additional decrease in your energy bill that you would accept?

13. (To the interviewer) What was the cumulative amount the participant was willing to accept?

INTRODUCTION: PARENTS

This survey will require your special attention. Although the situation being described is hypothetical, please answer the questions as if you were actually faced with the decision. You will be asked about your willingness to pay to avoid certain risks of death or injury to your child resulting from a nuclear plant accident. You will also be asked about your willingness to receive money to permit these risks to occur. Some of the effects of being in such an accident would not be felt for many years, particularly in the case of children. Therefore, please remember to include the cost that would occur over their entire lifetimes in your answers. Also, please remember that the risks being dealt with are only those that affect your child, and not you, your community, friends, other family members etc.

A nuclear plant accident, in this case, would include any type of explosion, plus any other mishap, act of sabotage or war, or natural disaster which would cause large amounts of radioactive material to be released from the plant and into the environment. A serious injury would be any illness or injury resulting from the plant accident, which would require hospitalization in normal times. Also counted as injuries would be the long term aftereffects such as cancer, sterility, birth defects in children born after the accident, and a shortening of life expectancy.